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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/708,618      | 03/16/2004  | Susumu Noda          | 39.040              | 2617             |

29453 7590 04/18/2005

JUDGE PATENT FIRM  
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NISHINOMIYA-SHI, HYOGO, 662-0035  
JAPAN

EXAMINER

BLEVINS, JERRY M

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2883

DATE MAILED: 04/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |   |                                    |  |
|------------------------------|---|------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/708,618    | <b>Applicant(s)</b><br>NODA ET AL. |  |
|                              | <b>Examiner</b><br>Jerry Martin Blevins | <b>Art Unit</b><br>2883            |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 2003/03/17 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |  |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)            |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>6/21/04, 12/14/04</u> | 6) <input type="checkbox"/> Other: ____  |

**DETAILED ACTION*****Specification***

The disclosure is objected to because of the following informalities: Lines 5 and 7 of paragraph 38, page 16, Detailed Description section, contain dimensional units for wavelength and lattice constant which are unknown. The applicants list a wavelength of 1.55  $\square$ m and a lattice constant of 0.42  $\square$ m. Although the meaning of the  $\square$ m unit is uncertain, the examiner interprets this to mean  $\mu$ m, since the correct unit apparently contains a special character. Appropriate correction is required.

***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double

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patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-11 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-11 of copending Application, Pre Grant Publication Number 2004/0165850 A1. Although the conflicting claims are not identical, they are not patentably distinct from each other because displacement of a low-refractive-index substance can reasonably be interpreted as a type of dimensional alteration of the low-refractive-index substance. Displacement in either one or two dimensions is an example of dimensional alteration.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-11 are rejected under 35 U.S.C. 103(a) as being obvious over Akahane, et al, "Design of a channel drop filter by using a donor-type cavity with high-quality factor in a two-dimensional photonic crystal slab", Applied Physics Letters, March 3, 2003, pages 1341-1343, in view of Srinivasan and Painter, "Momentum space design of high-Q photonic crystal optical cavities", Optics Express, July 29, 2002, pages 670-684.

Regarding Claim 1, Akahane teaches a two-dimensional photonic crystal configured by an arrangement, in a regular section of a two-dimensional lattice of points defined in a slab (page 1341, column 1, lines 1-2), of low-refractive-index substances having a small refractive index relative to the slab (page 1341, column 1, line 9 teaches that the low-refractive-index substances are air, while page 1342, column 1, line 22 teaches that the slab has a refractive index of 3.4) and being of predetermined identical dimension and shape (Figure 1), a cavity made from a point defect within the two-dimensional crystal, wherein: the point defect contains a plurality of three or more neighboring lattice points (specifically three as seen in Figure 1, L3 and T3), and in the

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plurality of three or more lattice points, the low-refractive-index substances are missing from the arrangement (page 1341 column 2, line 19).

Akahane does not teach that at least one of the low-refractive-index substances, that would otherwise be arranged to correspond to at least one among those lattice points being nearest the point defect, is dimensionally altered from its predetermined dimension. However, Srinivasan teaches that the geometry of a point defect and the surrounding holes in a two-dimensional photonic crystal can be altered in order to reduce the vertical radiation loss from the photonic crystal slab (page 673, section 3, line 3 and page 670, Abstract, line 6). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply the teachings of Srinivasan, that is to dimensionally alter at least one of the lattice points nearest the point defect, to the teachings of Akahane, in order to reduce vertical radiation loss in the slab.

Regarding Claim 2, Akahane teaches all the above limitations of Claim 1 but does not teach the further limitation that at least one among the lattice points being secondarily adjacent the point defect also is dimensionally altered from its predetermined state. However, the above reference to surrounding holes taught by Srinivasan can reasonably be interpreted as applying to secondarily adjacent lattice points, so the above obviousness argument applies to Claim 2, as well.

Regarding Claim 3, Akahane teaches a point defect consisting of exactly three lattice points (referenced above), which is, by definition, fewer than six lattice points. Therefore, Akahane reads on all the further limitations of Claim 3.

Regarding Claim 4, Akahane teaches the above limitations of Claim 1 but does not teach that the wavelength of light that resonates in the cavity is adjustable in dependency upon the dimension and shape of the point defect. However, Srinivasan teaches that the cavity will support various resonant modes that depend on the nature of the point defect (page 673, section 3, line 3). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to apply the teachings of Srinivasan, that is that the resonate wavelength of the light in the cavity is adjustable depending on the dimension and shape of the point defect, to the teachings of Akahane, in order to confine light of a wide bandwidth.

Regarding Claim 5, Akahane teaches the further limitation that the plurality of lattice points which form the point defect are lined in a line segment (page 1341, Figure 1, L3).

Regarding Claim 6, Akahane teaches the further limitation that the low-refractive-index substances are filled into columns perforating the slab (page 1341, Figure 1).

Regarding Claim 7, Akahane teaches the further limitation that the lattice points of the two dimensional lattice are arrayed in a triangular lattice (page 1341, column 1, line 8).

Regarding Claim 8, Akahane teaches the further limitation that the slab has a refractive index of 2.0 or greater. (Specifically, the slab index of refraction is given as 3.4 on page 1342, column 1, line 22).

Regarding Claim 9, Akahane teaches the further limitation that the low-refractive-index substances are air (page 1341, column 1, line 9).

Regarding Claim 10, Akahane teaches the above limitations of Claim 1 as well as a channel add/drop filter comprising at least one waveguide from a line defect within a two-dimensional photonic crystal, the cavity being disposed adjacent the waveguide, within a separation in which an electromagnetically reciprocal effect is produced between the cavity and waveguide (page 1341, Figure 1(a)). However, Akahane does not teach the combination of the above waveguide with the cavity as set forth in Claim one, but rather Akahane teaches the above waveguide adjacent to a single point defect cavity. Akahane does teach that a three-hole point defect cavity has a higher Quality factor than its one-hole counterpart. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Akahane in order to create a channel add/drop filter, as specified in Claim 10, that has a greater Quality factor than the one actually taught by Akahane.

Regarding Claim 11, Akahane teaches the above limitations of Claim 10 but does not teach a plurality of cavities where the cavities differ from one another in resonant frequency. However, Srinivasan, as mentioned above (page 673, section 3, line 3) teaches that the resonant frequency of the cavity depends on the dimension and shape of the point defect. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply the teaching of Srinivasan, that a plurality of cavities can differ from each other in resonant frequency depending on the dimension and shape of the cavity point defect, to the add/drop filter taught by Akahane in order to broaden the bandwidth of the add/drop filter.



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***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jerry Martin Blevins whose telephone number is 571-272-8581. The examiner can normally be reached on Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font can be reached on 571-272-2415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JMB



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